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FOOD PREPAREDNESS

By ALBERT P. SY, Ph. D.

NIAGARA SQUARE
BUFFALO, NEW YORK

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Introduction

THE past few months have more and more impressed upon Americans the need of preparedness in every department of life. Perhaps some of the alarm created is unnecessary; but with regard to the production, conservation, and prudent use of food, our concern should be timely. In presenting the bulletin upon "Food Preparedness" the University of Buffalo feels sure that it can render the people of this vicinity valuable advice and assistance. The paper has been prepared by Albert P. Sy, Ph.D., Professor of Chemistry, who has given the subject of food and diet especial attention for many years. The series of bulletins of which this forms one issue will be practical in character and popular in style, devoid of the technicalities which so often render scientific information forbidding and useless. We hope for the widest possible distribution of these tracts of the times, which may be had for the asking from the Secretary of the Faculty of Arts and Sciences, at Townsend Hall.

Committee on Publications.

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Food Preparedness

An adequate food supply and a careful study of diets are the basis of national well-being. Education, medical attention, economics and recreation are of considerable importance but each and all depend upon proper nourishment of the physical body.

Until recent years little or no attention has been paid by most people to matters of food and diet; the first serious agitation in this country does not date beyond the memory of those who read this. I refer to the time when the question of a Pure Food Law began to be seriously considered by the people and their representatives in Congress. After several years of fighting against the unscrupulous and greedy food interests, our present Food and Drugs Act became a law, in June, 1906.

Since that year more progress has been made in the study of foods and diets than in all the time preceding it. The Bureau of Chemistry of the United States Department of Agriculture with its branch laboratories throughout the country has made it unprofitable to adulterate and misbrand food products. The public hardly appreciates the great service rendered by this branch of government inspection. It should be said, however, to the credit of the large majority of food manufacturers and dealers that they are jealous of their reputation to supply the public with honest and correctly branded foods. The public knows what to expect of foods bearing certain labels—they buy these foods with confidence in their purity. Several factors were instrumental in calling the public's attention to a serious study of foods:

First, the controversy preceding the enactment of the Pure Food Law.

Second, the adulterations discovered and published as a result of enforcing the law.

Third, the rise in prices, partially a result of the crusade for better foods.

Not until there occurred an appreciable rise in prices did the majority of our people begin to pay serious attention to foods. As long as the supply seemed abundant and prices reasonable, very few people paid any attention to matters of diet. That the time is at hand for most serious and earnest study of our food problems is a statement which surely does not admit of debate. If, under ordinary circumstances, such a study involves a variety of factors which make the problem complicated, what is to be said about the present most extraordinary conditions? And what about conditions of the immediate future? A few years ago the person who was not writing or talking about "efficiency" was not up-to-date. Efficiency found its way into every conceivable nook and corner of our educational, professional, industrial and agricultural life.

But lately another word has been coined—"preparedness". It is not an exaggeration to say that with characteristic American enthusiasm we promptly proceeded to lose our heads over this new word, and this very fact shows one thing more plainly than anything else, namely, our unpreparedness. Even now, after the preliminary excitement has partially subsided, the word "preparedness" to most people means soldiers, guns, cannon, cruisers, submarines, air-planes, fortifications and explosives. Those whose thoughts on preparedness penetrated a little deeper discovered that it includes doctors, nurses, hospitals and medical supplies. By the time these words are in print, it is hoped everybody who is capable of a serious thought will realize that just as important and vital as anything else pertaining to preparedness is the question of food.

Feeding and fighting are two inseparable terms. A minute's reflection should suffice to show the utter uselessness of any scheme of preparedness that does not include an elaborate study of the food problem. The time is at hand when we, each of us, must think and act seriously. Preparedness must have a personal meaning. There can be no national preparedness without individual preparedness. *The first step in patriotism is personal preparedness.* There can be no preparedness without health.

and health is impossible without correct personal habits and adequate food. National preparedness resolves itself, therefore, into correct living which in turn is based upon proper nourishment, not only for today but for tomorrow. At ordinary times and under ordinary circumstances, questions relating to an adequate diet involve no great complications, but circumstances are most unusual; the supply of food seems limited, something which we as a wasteful nation never before believed possible.

The one factor which has helped more than any other to bring us to our senses about our food is its cost. "Money talks", and food prices are fairly shrieking at us at every turn, a state which has a serious meaning to everybody alike. The easiest way to interest most people in any kind of a problem is to force their attention to the question of cost.

But, let us come back to preparedness. I can serve my country best by being prepared personally and by helping others to a similar condition. The person with all kinds of advice and criticisms who is not personally prepared nor doing anything to help others presents an argument without force.

The importance of food to personal preparedness is not debatable; it is an axiom. Teachers, preachers, doctors and others who come in contact with the public should study foods and diets; physicians particularly can be of great service. There is great need of instruction in food values, dietetics and personal hygiene. Prices tell their own story and are educating the public in matters of food and diet, and the physician can add scientific argument to that of prices. Teachers of all grades, from kindergarten to university, should be required to study foods. An outline for study, including a list of books and other literature of the subject, should be provided. There are parents who are doing themselves an injustice and who are neglecting a principal duty of parenthood by their indifference toward their own and their children's food problems.

Many people are unprepared because of circumstances over which they have no control. But many more are unprepared mainly because of indifference and preventable ignorance. I use the term "preventable ignorance" because anyone really in earnest has little difficulty in becoming well informed on matters of food and diet by making use of our modern library facilities, attending lectures and by reading journals and magazines. A word of caution is necessary at this point. Much that is said or written is misleading or untrue. Our daily newspapers often contain much misinformation. But it should be remembered that our newspapers are not scientific journals where accuracy counts most; they are rather the medium for the exchange of ideas where people express their opinions.

Let us now consider briefly some of the elements that make for personal preparedness.

First, one should know something about modern theories of diet. Many excellent books exist on this and related subjects, and can be found in almost any modern library. Particularly good is A. Bryce's *Modern Theory of Diet* and his smaller work on *Dietetics*.* By spending as much time on one of these books as is required to read an ordinary novel or "best seller", one would get much valuable information—information which every well informed person should have, and which has not only an educational but also a monetary value.

The nutritive requirements of the body must be known before the nutritive values of different foods can have a real meaning. But first of all, a knowledge of the chemistry of foods is necessary. I will not attempt to define the term "food"—one who knows anything at all about foods knows what meaning is to be conveyed by this term. We all know that it is the food we eat which makes us grow and gives us energy or ability to sustain our bodily functions and do work.

*See also: Fisher: *Physiology of Alimentation*.
Stiles: *Nutritional Physiology*.

Scientists are practically agreed on classifying foods as follows;*

First: Protein foods. These have as their principal chemical constituent the element nitrogen in such a form as to be readily assimilated and used by the body. These protein foods are absolutely essential for the building up and repairing of our body. Without them there would be no development and the animal would soon perish. These foods are sometimes called the *nitrogenous foods*. As examples of this class of food stuffs we have the white of an egg *which is very nearly pure protein, containing about 86% of water*. Other proteins are the lean part of all meats and fish, the gluten in wheat (other grains also contain proteins), the casein in milk and cheese. Many other foods contain proteins. Some of the protein foods are cheese, 26% ; peanuts 26% ; beans 23% ; meats 19% ; fish 17% ; eggs 15% ; wheat 12% ; oats 12% ; corn 10% ; bread 9% ; rice 8% . A brief study of these percentages will indicate how substitution might be made. Cheese, beans or even bread might at times be used partly or wholly in place of meat.

Second: Another important class of foods consists largely or entirely of what chemists call *carbohydrates*. The various sugars and starches are representatives of this class. Pure carbohydrates such as the sugars and starches do not contain nitrogen and can therefore not be substituted for proteins. They are called the heat- and energy-producing foods. The important foods of this class and their percentage of sugar or starch are: Cane and beet sugar over 99% ; hard candies 96% ; honey 81% ; jelly 78% ; raisins 76% ; rice 76% ; wheat 74% ; corn 73% ; oats 70% ; molasses 68% ; beans 60% ; bread 53% ; bananas 22% ; grapes 19% ; potatoes 18% ; apples 14% .

Third: The third important class of foods is known as *fats*. Lard, olive and peanut oils are pure fats; they contain no nitrogen and will not do the work of protein foods. The function of

*Food charts, in colors, published by U. S. Department of Agriculture.

Fats the fats in metabolism is similar to that of the carbohydrates, namely to supply heat and energy. The fatty foods with a high percentage of fat are as follows: Lard, olive and peanut oils 100% ; butter 83% ; bacon 67% ; walnuts 63% ; peanuts 39% ; cheese 34% ; cream 19% ; meat 18% ; eggs 11% . These three classes of food principles alone are not sufficient to produce growth and energy in the human body; a small amount of a number of inorganic substances called "*salts*" is necessary. These salts are sometimes referred to as "*mineral matter*". The chemist often uses the term "*ash*" and has reference to the residue after burning a food. Foods naturally contain the necessary amount of mineral matter or salts. The addition of common table salt to our foods is not necessary unless it makes them more palatable.

Water, of course, is necessary in our diet and it plays a much more important part than is generally supposed or understood. Most foods contain water, and although some people seem to get along with practically no water other than

Water is contained in the solid foods they eat,

most of us add water to our diet either as water or beverages that are largely water, such as tea, coffee, milk or cocoa. The percentage of water is usually high in vegetable foods. Celery contains 95% water; milk 87% ; oysters 86% ; apples 85% ; fish 80% ; potatoes 78% ; eggs 74% ; meat 62% ; bread 35% ; cheese 34% ; honey 18% ; butter 13% ; lard, olive oil, peanut oil, and sugar contain no water. One often hears the statement that people do not drink enough water. This is no doubt true. I cannot let the opportunity pass without calling attention to the old but erroneous notion that water should be drunk between meals, not during meals. This idea that

Drinking with meals water at meal time interferes with the digestive process is still quite prevalent, even among physicians. Newspaper and magazine food "*experts*" almost invariably tell us not to drink with meals. Let it be stated most emphatically that drinking water

with our meals is not a harmful or undesirable practice, but is a decidedly beneficial one. This has been proved repeatedly by rigid scientific experiments. It is now known that water, and fluids generally, stimulate the secretion and flow of gastric juice; water also materially aids and hastens the processes of digestion and assimilation. It is physiologically correct to start a meal by drinking water or eating soup. It has been proved that a cocktail or other high alcoholic drink at the beginning of a meal interferes with digestion.

Nearly all foods contain more or less indigestible matter which is classed under the term "crude fiber". Although it is indigestible and does not take any part in metabolic processes directly, it serves an important purpose. **Crude fiber** namely to increase intestinal peristalsis which in turn aids in the absorption of food and elimination of waste matter. Vegetables, fruits and grains contain considerable crude fiber, and, partly for this reason, these foods are valuable and should be included in our daily diet list. Our objection to refined foods is that frequently they contain no crude fiber.

Until recently the comparison of foods has been studied with reference to their content of protein, carbohydrate, fat, mineral matter, water and crude fiber. During the last few years, however, it has been discovered that normal metabolism can be maintained only when, in addition to the above mentioned constituents, our foods contain a certain amount of substances called "vitamines".* The exact chemical nature of vitamins is still unknown, but there is no doubt that a diet which is deficient in these substances produces serious nutritional disturbances. Diseases such as beri-beri and pellagra are called "deficiency diseases", and it is believed are due to the lack of vitamins in the diet. A fairly well mixed diet, particularly one which includes some raw foods and is not largely made up of refined foods, contains enough vitamins for maintaining normal metabolism.

*A. Seidell, Reprint 325, Public Health Reports, Published by the United States Public Health Service, Washington, D. C.

Palatability In addition to having the correct chemical composition, foods must be *palatable*; they must look and taste right. Unpalatability interferes seriously with digestion. Not until our attention is called to it do we notice that the flavor of food receives a very considerable amount of consideration. This phase of our diet has been carefully studied by physiological chemists and others.*

One of the chief aims of the instruction in cooking, and preparation of foods, in our modern domestic science courses is to make our meals as appetizing and palatable as possible. And just now while we are facing serious food problems, such as a restricted choice, our cooks will find it well worth while to devise methods for making available foods palatable.

Closely related to their chemical composition is the nutritive value of foods. This is commonly known as "food value" and for want of a better method is expressed in terms of heat calories. The expression for example, "1200 calories per pound" means that the food in question, when one pound of it is burned, yields 1200 calories of heat. The processes of metabolism in the body resemble burning, and a pound of such food yields nearly 1200 calories of heat.

In calculating food values the principal food materials,—protein, carbohydrates and fats—only are considered; the mineral matter and water do not enter into the metabolic processes to produce heat or energy.

Bread furnishes 1180 calories per pound and three pounds would supply approximately the food value necessary for one day. Beef-steak is slightly less nutritive, being rated at 1090 calories per pound. Sugar produces 1810 calories per pound and a little less than 2 pounds contains the energy for a day's work. Most people will be surprised to learn that one and one-third pounds of peanuts (shelled) at 2485 calories per

*H. T. Finck, *Food and Flavor*, Century Co.

pound contain the equivalent of a day's food. Milk produces only 315 calories per pound, while olive oil and lard are each rated at 4080 per pound. The table at the end of this pamphlet shows calories per pound of our common food materials. It will be noted that fruits and vegetables and other foods with a high percentage of water have a low calorific or food value, while those rich in fat have the highest values.

An average man doing ordinary work requires daily enough food to produce from 3000 to 3500 calories of heat. Laborers doing hard work require considerably more, while people doing but light muscular work can get along with 2000 calories. These heat calories should be produced by foods constituting a mixed diet; that is, containing some of each of the food principles described. Enough of this mixed diet should be eaten to maintain a nearly constant body weight in the case of adults; a considerable gain or loss in body weight can in most cases be attributed to an excessive or deficient diet. *One should eat only palatable food and only when hungry.* We should eat, not because we feel it a duty or necessity—we should enjoy our food; we should eat for the pleasure it gives us. Food should be kept in the mouth until all taste or flavor has been chewed out of it. The flavor of food should be our guide as to *what* to eat; hunger should control *how*

Fletcher- *much and when* to eat; and common sense and
ism knowledge of the foods should tell us *how*
to eat. Fletcher's idea is worth noting*:
"I can not advise you appropriately what to eat, when to eat, nor how much to eat; neither can anyone else. Trust to Nature absolutely, and accept her guidance. If she calls for pie, eat pie. If she calls for it at midnight, eat it then, but eat it right."

Volumes could be written on dietary fads; the books on vegetarianism alone would fill a small library. A vegetarian is a person whose protein requirement is derived from vegetable instead of animal foods. Another fad is to eat only raw foods, on the theory that food should be eaten the way nature made it. Then there is the

*Fletcher: *Fletcherism, What it is*, p. 35.

mono-foodist who eats but one kind of food at a meal, and the one-mealer who tries to make one meal a day suffice. Many have tried the no-breakfast plan; others live largely on milk and milk products, and still others make their menu largely of nuts. When too much attention is paid to a single food a fad results. It is no doubt true that here and there some individual has been greatly benefitted by following a fad. Since there are still many unknown or incompletely understood factors in diet and metabolism, the greatest safety or wisdom lies in a varied diet.

While on this subject of fads let us mention the ever-present food quack. The country is flooded with the literature and advertisements of these self-styled food experts, who almost without exception show a miserable lack of knowledge of even the elementary principles of physiology, digestion, and the chemical effect of foods; their theories about disease are often ridiculous. It is difficult to understand why there are still so many magazines and newspapers whose advertising columns are open to any food quack who can pay for space. Now and then a food faker is barred from the use of the United States mails.

Almost as bad as the quack is the alarmist, ever ready to act as the guardian of the people's stomachs and health. He gets an idea that a certain food is bad, or a color or preservative injurious, and rushes into print to give the alarm. His arguments are neither correct nor reasonable. He has us poisoned daily by preservatives and colors; our digestion ruined by fats or sugar; our intestines glued together by glucose. We are eating too much, or America is starving; and then there is always the subject of adulteration to fall back on.

It is hardly necessary to sound an alarm against the quacks and alarmists. We are fast learning how to discount what we hear and see about foods.

Substitution

There is an unpleasant sound to the word substitution. When used in connection with foods it brings to our minds the idea of an ethical or commercial fraud. But as a matter of fact there is very little illegal substitution in foods. Within the last few years the word substitution has assumed a somewhat different meaning. Various conditions have made it desirable, even necessary, to study and practice the substitution of one food for another. We can do this the more intelligently, the better we are acquainted with the composition and function of different foods. Of course the principal reason for substitution is the fact that on account of great demand, under-production or speculation, the increasing prices of certain foods tend to make their use prohibitive. In order to avoid deceiving ourselves in this matter of food substitution the following general principles should be kept in mind: First, the substituted food should have nearly the same food value; second, it should be as palatable; and third, it should be cheaper, or at least not more expensive than the food the place of which it takes.

Let us now consider specifically some practical substitutions. The most important foods are those rich in proteins; we must eat a certain amount of them, and meat comes first in the minds of most people when a protein or nitrogenous food is mentioned. For various reasons meat prices have so risen that people are compelled to study economy and possibilities of substitutions. The Protein substitutions present meat situation is no doubt a blessing in disguise, because it is sure to bring about a much needed nutritional reform; until recent years we as a nation, have eaten too much meat. Present and future prices will make for a lower protein diet and better health, as well as economy, and will give us a valuable lesson in substitution. Although vegetarians seem to have demonstrated that some people can get along without meat, I have no intention of urging an entirely meatless diet. Since we have so long been a meat-eating nation, it would seem unwise to make such

a radical change. But it does seem desirable to use less meat, substituting foods with a high protein percentage. The most practical method for reducing meat consumption is for the cook to make a study of recipes, (1), where cheaper cuts of meat are used; (2), where a little meat is used for producing flavor; (3), which call for no meat at all.

The first step toward a lower meat bill is by the use of cheaper cuts. Extensive research by government experts shows that the cheaper cuts of meat contain practically the same nourishment as the more expensive ones. The latter are usually more tender and contain more flavoring substances, technically called "extractives". However, clever housewives—fortunately there are a great many of them—by skillful preparation, flavoring and cooking can make the cheaper cuts most palatable and appetizing. The toughness of some of the cheaper cuts can be overcome by pounding, and by previously sprinkling a little flour over the meat the juices and flavors are more readily retained.

The meat chopper can also be used to advantage in making the cheaper cuts more appetizing. These cheaper cuts can best be prepared in a fireless cooker. The following recipes which are taken from a government bulletin show how to use the cheaper meats.

CASSEROLE ROAST—(A casserole may be improvised by using a heavy earthenware dish covered with a plate.) Brown a round or rump of beef in fat from a slice of fried pork. Place in casserole with chopped carrot, turnip, onion, celery, etc., around it. Add two cupfuls of water or stock, cover and cook in hot oven three hours, basting occasionally.

BRAISED BEEF OR POT ROAST—Brown the meat on all surfaces, place in closely covered kettle or other receptacle with small quantity of water and flavoring vegetables, such as onion, carrot, etc., and cook until tender. Browning the meat helps to keep in the juices. The slow cooking in water and steam makes for tenderness.

SAVORY BEEF—Cut a pound of top round of beef into two-inch pieces and sprinkle with flour; fry a small piece of salt pork until light brown; add beef and fry for about 35 minutes, stirring occasionally. Cover with water and simmer about two hours (fireless cooker may be used); season with salt and pepper or paprika. Serve with a sauce made as follows: Cook in water 20 minutes a cup of tomatoes, part of a stalk of celery, one-half onion, three whole cloves, three pepper-corns and one blade of mace or a very little nutmeg. Rub through a sieve, add some of the gravy from the meat, thicken with flour moistened with cold water, and season with salt and paprika. Noodles, boiled rice, hominy, or chopped potatoes, carrots and green peppers or other vegetables in season, may be served in the same dish.

An important point which is often overlooked in the use of any kind of meat is waste of trimmings and left-overs. The former should be saved for the fat they contain, while the left-overs can be used in many ways. Small pieces of different kinds of meat often make a good combination in the same dish. Veal, chicken and pork can be used for croquettes; all kinds of meat may be put in hash.

(2) The next step in meat economy is to use it for flavoring other foods which contain the necessary amount of protein. The modern cook knows many ways of doing this. She makes stews, hashes, croquettes and casserole dishes. Then there are recipes where meat is used with bread crumbs, rice, meat pies; where it is used with pastry, dumplings and other combinations with starch food such as spaghetti or macaroni, and finally the almost numberless combinations of meat with vegetables.

The following are examples of the use of meat for flavoring purposes:

STEW WITH DUMPLINGS Make stew from small pieces of meat and vegetables, cooking it on stove or in fireless cooker. Serve with dumplings made as follows: For a stew using one pound of meat mix a little more than one-third cup

flour with one teaspoonful of baking powder and a pinch of salt, work in a rounding teaspoonful of butter and mix with enough milk to form a medium stiff dough. Cut into small pieces and cook in a buttered steamer over a kettle of boiling water or remove enough gravy from the stew to expose the meat and vegetables and place the pieces of dough on these solid materials to cook.

MEAT PIE—Meat pies are made most satisfactorily by first cooking the meat and vegetables as for a stew. Line a pan, earthenware dish, or casserole with biscuit dough rolled fairly thin, put in the meat, vegetables and gravy, cover with dough and bake in a hot oven.

MEAT TURNOVERS—Place any chopped cooked meat available on circles of biscuit dough about the size of a saucer. Fold the dough over the meat, crimp the edges and bake in a hot oven. Vegetables may be combined with the meat filling as desired and the whole may be served with gravy.

VEAL OR BEEF BIRDS—Cut very thin meat into roughly rectangular pieces of a sufficient size for individual servings. Place on each a stuffing of bread crumbs, seasoned with chopped onions and other flavoring vegetables and herbs. Fold or roll up the meat and skewer in place with tooth picks. Brown the rolls in fat, remove and make gravy from the fat, flour and stock if available. Place the rolls in the gravy and cook slowly until tender in a covered baking dish, a steamer, or a fireless cooker.

BEAN CRUST MEAT PIE—Take one cupful boiled bean pulp; $\frac{1}{2}$ teaspoonful salt; 1 teaspoonful baking powder; 1 egg, beaten; 2 tablespoonfuls melted fat; flour to make a soft dough. Mix, and roll to about $\frac{1}{8}$ inch in thickness on well-floured board. Cut strips of suitable size, when folded, for individual pies. Fill the pies with chopped, cooked meat or vegetables. Fold crust over, press edges together and bake in moderate oven until well browned. If vegetables are used instead of meat, this might be called "bean crust vegetable pie" and would then belong with meatless dishes.

BEAN-HAM LOAF—Take 2 cupfuls cooked lentils (or beans), 2 cupfuls minced cooked ham, 1 minced onion, 1 egg, beaten; $\frac{1}{2}$ cupful bread crumbs, $\frac{1}{2}$ cupful milk, 2 tablespoonfuls butter. Mix and shape into a loaf. Bake 30 minutes in moderate oven.

(3) The third and final step in saving meat is of course by the use of recipes for meatless dishes.

BOSTON ROAST—A good example of such a recipe is the so-called Boston roast, the cost of which is only about one-tenth of that of an equivalent amount of nourishment in the form of roast beef. Take one pound of beans, cook and put them through a meat grinder; add one-half pound of grated cheese and enough bread crumbs to make the mixture stiff enough to form into a roll. Place in buttered baking pan and bake in moderate oven. Baste with one-half cup of hot water in which a tablespoonful of butter has been melted. The roast may be flavored by the addition of finely chopped onions, and can be served with tomato sauce if desired.

BEAN LOAF—Take the following: 1 pint of cold baked beans, 1 egg beaten, 1 cupful bread crumbs, 1 tablespoonful finely minced onion, 2 tablespoonfuls tomato catsup; salt and pepper. Mix these ingredients thoroughly and shape into a loaf. Bake for 25 minutes. Serve with strips of broiled bacon on top.

PEANUT LOAF—Take 1 cupful mashed potatoes, 1 cupful fine ground peanuts, 1 cupful milk, 2 eggs beaten, seasoning. Mix ingredients and shape into a loaf; bake in moderate oven for 20 minutes.

These two recipes* will serve as illustrations of meat substitutions. Many others may be found in recent literature on cooking.** The table on the last page shows which food-stuffs have a high percentage of protein and are therefore suitable as meat

*The Cornell Reading Courses, June 1, 1915, Page 190.

**Mrs. Rorer: *Vegetable Cookery and Meat Substitu* *e.*

substitutes. Of course the cost of these substitutes must be considered. Eggs at winter prices or expensive cheese would effect no economy.

The time is not far distant when vegetable proteins not now in use as human food will be common. At present they are utilized in feeding stuff mixtures for cattle and horses and hogs.

Vegetable protein by-products I refer to the by-products of the vegetable oil industries. In the manufacture of oils from corn, peanuts, cottonseed, linseed and cocoanut there is left a "press-cake" which is especially rich in protein. The chief reason why these protein residues have not been seriously considered for human consumption is their flavor, and the fact that other and more palatable proteins are easily obtainable. But the ingenuity of the food-chemist and the cook, aided by scarcity of meats and other protein foods, will probably make some of these by-products available for our dietary.

Carbohydrate Substitutions

The principal carbohydrate foods are flour and bread, the different cereals and breakfast foods, rice and sugar. Until quite recently, none of these food-stuffs had prices that called for a study of substitutions. But just now prices are advanced almost daily, especially on flour and sugar. Here again we have a blessing in disguise, for it is hoped that the public can be convinced of a number of misuses and abuses of these foods.

On account of a desire to have our bread as white as possible and also because of ignorance in the matter of nutritive values, we discard about one-third of the wheat in milling. And

Whole wheat products this discarded portion includes some of the most valuable parts of the wheat, particularly mineral matter, crude fiber, and no doubt some vitamins. The fact that the millers were compelled to "bleach" flour with chemicals shows that the public demanded a flour as white as it was possible to make it. For years, food chemists and dietitians have urged a more complete use of wheat

for making flour. Whole wheat flour produces a more nutritive bread, a more natural and complete food; at the same time much more flour is produced from the same amount of wheat. This lesson has been thoroughly learned by European nations during the last year, and now it is our turn. Let us hope the millers will soon receive government instruction as to the amount of flour that will be expected from a bushel of wheat. The substitution of whole wheat flour for white or "patent" will be a most important step toward health and economy. While waiting for whole wheat flour to become more popular and better appreciated, we are making extensive use of whole wheat products in the form of cereal breakfast foods. Such foods must be classed as the very best because they include all the ingredients put into the wheat-berry by nature; they contain all the mineral matter which plays an important part in metabolism; they contain what is lacking in many other breakfast foods, namely, crude fiber—which is an aid to intestinal activity and prevents constipation; and finally they are never bleached or otherwise chemically treated. By carefully observing the labels on breakfast foods it is a simple matter to pick out whole wheat products.

The next step in flour substitution is the use of a mixture of wheat and corn flour. Corn products will probably always be cheaper than wheat products, and these two are of about the same nutritive value. The substitution is therefore physiologically permissible and economically desirable. Corn-flour, and wheat- and corn-flour mixtures are not generally sold as yet, but if present wheat prices continue corn flour will soon become a necessity. Cornmeal and other corn products are already in use; they are the cheapest and best wheat substitutes we have at present. Nothing need be said here about recipes for using cornmeal since they may be found in any cookbook.

As soon as potatoes reach their normal price again, they can be used as a substitute for bread or other wheat products. The Bureau of Chemistry at Washington has published the following

Potatoes recipe developed by Miss H. L. Wessling. It produces a tasty and nourishing bread from potatoes. the quantities of material used making four one-pound loaves.

POTATO BREAD—Boil, peel and mash while hot, enough potatoes to make five cups; add two cakes compressed yeast rubbed smooth in four tablespoons of water. Now add three level tablespoons of sugar, half as much salt, and a scant cup of flour. Use a half-pint cup. Mix thoroughly by hand. Do not add more water. Let rise until quite light, about two hours. Now add two pounds of flour, knead thoroughly to a very stiff dough. Do not add more water. Let it rise until it is three times its former size, from one to two hours. Now take a little of this dough and press it into the bottom of a straight sided water glass and mark a spot on the glass twice the height of the dough. Divide the rest of the dough into four loaves and put into warm greased pans. Set the water glass next to pans and let all rise. When the dough in the glass has doubled in volume, put the loaves into oven and bake for 45 minutes.

POTATO BISCUITS—Take 1 cupful mashed potatoes, freshly cooked; 1 cupful flour; 4 teaspoonfuls baking powder; $\frac{1}{2}$ teaspoonful salt; 1 tablespoonful butter; 1 tablespoonful lard; $\frac{1}{2}$ cupful milk. Sift the dry ingredients and add them to the potatoes, mixing with a knife. Now work in the butter and lard and enough milk to make a soft dough. Place dough on floured board and roll lightly to $\frac{1}{2}$ inch thickness. Cut out with biscuit cutter, place in well greased pan and bake in hot oven for 15 minutes.

Other excellent potato recipes can be found in The Cornell Reading Courses, Feb. 1, 1915.

Carbohy- Another source of carbohydrates is in some
drates in vegetables, especially beans, peas and lentils.
vegetables These were mentioned under substitutes for meat because of their high protein content, and while primarily used for their protein, they supply at the same time considerable carbohydrate food.

A substance which deserves particular mention in this connection is glucose. It has been and will be used as a substitute for sugar. Not many years ago it would have been useless to

Glucose tell people that glucose should be classed as a food.

Over-zealous food reformers had convinced the public that glucose was to be shunned like poison. But time has changed this; unbiased investigations have proven that glucose as now manufactured is a wholesome and pure food material. It is made from cornstarch by a simple chemical process, and consists mainly of the simple sugar dextrose (sometimes also called glucose) and a smaller amount of dextrin and maltose. These ingredients are all easily digested, in fact the dextrose is already in a form ready for absorption. Very few people know glucose in its original condition—a water-white heavy sirup; but we buy it in various slightly modified forms for table use and for baking, candy making and other purposes. Enormous quantities of it are used by the bakers for sweetening purposes as a substitute for sugar; almost all candies, low and high priced, are made largely from glucose; brewers use it, spirit vinegar is made from it. Its principal use, however, is a sweetener in place of the more expensive sugar. It has not replaced sugar to any considerable extent in the household cookery, but the prediction is here ventured that the housewife will not be long in adopting glucose for home cooking.

As in the case of wheat flour, cane and beet sugars might be classed among the over-refined foods. We demand a certain color or appearance in our food-stuffs, in utter disregard of

Over-refining of foods composition or what must be done to such foods. Ketchup must be red, butter must be yellow and sugar must be snow white; to produce this effect

in the latter it had to be over-refined, all the natural mineral substances removed from it, and finally "bluing" added to it to disguise the last traces of yellowness. But we are learning the fallacy of such practices. By substituting a less refined sugar we not only get more sugar but a more wholesome article. This obviously is economy. The word "sugar" is here

used to include both cane and beet sugar. The only difference of which I am aware between those two is the wholesale price. Cane and beet sugars which is a few cents lower for the beet sugar; the retailers charge the same price for both, and the consumer is absolutely unable to tell the difference between them. Chemically these sugars have the same formula, and scientific research shows that no difference can be detected in their use. Some housewives and candy makers claim they can tell the difference; these same people are probably also the ones who tasted the chlorine in our Buffalo drinking water three weeks before the chlorination process started.

Proso millet and sorghum As the very latest additions to our carbohydrate foods should be mentioned the starches or flour obtained from proso millet and sorghum. Some of our State experiment stations are conducting investigations and preliminary announcements tell us that these products will surely be available and suitable as carbohydrate foods.

Now that flour and wheat products are high priced, rice is being more seriously considered as an addition to our dietary. It is essentially a carbohydrate food, similar to wheat and oats except that it contains less protein. Three kinds of rice are found in our stores, "unpolished", "polished" and "coated". The well informed housewife knows that the polished and coated kind belong to the class of over-refined and adulterated foods. The unpolished kind retains most of the original mineral salts and fat and is a more or less complete food, while the polished kind must be classed as deficient. Pigeons fed exclusively on unpolished rice seem well nourished, but when fed on polished rice they soon develop a food deficiency disease, polyneuritis, and die. Only unpolished rice should be used for human food. To use any other betrays an ignorance in matters of diet. Rice cooking is well described in modern cook books. The January 1, 1914, number of the Cornell Reading Courses contains valuable information about rice and recipes for its use.

Fat Substitutes

When thinking of fat foods, butter comes to mind first. We are a nation of butter eaters, and it will be a slow process to educate us to the use of substitutes. The chief butter substitute on the market now is oleomargarine. Ignorance as to its composition and the propaganda of the butter interests, aided by laws passed by legislators from rural districts, have prevented a more universal use of butter substitutes.

The actual nutritive value as expressed in calories is practically the same for all fats and oils. Oils and softer fats are somewhat more completely and quickly digested than the harder ones. It has been discovered recently that butter contains some unidentified substances which make it a more complete food than some other fats. Experiments indicate that butter and cod-liver oil contain the growth-promoting substances, while in lard and olive oil they are absent. It is therefore suggested that our diet should always include some butter or other milk products such as cream, cheese or milk itself.

Many people who find a flavor of butter-substitute objectionable are using a mixture of part butter and part substitute. Of the more palatable substitutes are those containing nut and corn products; a mixture of two parts of nut-margarine and one part of butter is surely more palatable than many brands of pure butter. For cooking purposes other fats have long been used instead of butter, but the future will see much more substitution. According to conditions, uses, and cost, the following come under consideration: cottonseed cooking oil, cottonseed oil products such as Crisco, peanut oil, the cheaper grades of olive oil, corn oil. Until recently corn oil has had an objectionable flavor, but it can now be had with a most agreeable nutty flavor, somewhat like peanut oil. Just at present the cocoanut oil industry is being developed and this finely flavored fat should be a desirable addition to the list.

An enormous amount of fat is produced in the fish industry, but so far it has not been possible to make fish oil palatable. It is only a question of time, however, when this problem will be solved and then we shall have another important source of fat food.

As a matter of every day and particularly as a war-time economy, the housewife is carefully saving the fat from trimmings, drippings from roasts, bacon fat; beef, pork, chicken, turkey and bacon fats can be mixed; there is no reason for keeping them separate. Such mixtures can be used for many culinary purposes, such as shortening and frying.

Sanitation

Although making rapid progress, we are still quite unprepared in food sanitation. As an example I quote the proposed Buffalo Sanitary Code which has been discussed and modified for nearly a year. Everybody realizes the need of a sanitary code for the other fellow. No matter how perfect in chemical composition or palatable and appetizing a food is, *if it has not been produced, handled, and prepared in a sanitary manner it constitutes a menace to health.* Foods are easily contaminated; many spoil quickly. Much has been said and written on unsanitary methods in food production and handling; I shall only add that the next great step forward will be a rigid enforcement of a law requiring health and cleanliness in persons who handle foods.

COMPOSITION AND CALORIES OF FOODS

	Water	Protein	Carbo- hydrate	Fat	Calories- per lb.
Apples	84.6	0.4	14.2	0.5	285
Bacon	18.8	9.4		67.4	3090
Bananas	75.3	1.3	22.0	0.6	145
Beans, dry	12.6	22.5	59.6	1.8	1560
Bread	35.3	9.2	53.1	1.3	1180
Bread, whole wheat	38.4	9.7	49.7	0.9	1110
Bread, corn	38.9	7.9	16.3	4.7	1175
Butter	13.0	1.0		83.0	3405
Buttermilk	91.0	3.0	4.8	0.5	160
Candy	3.0		96.5		1745
Canned fruit	77.2	1.1	21.1	0.1	105
Celery	94.5	1.1	3.4		80
Cheese	3.42	25.9	2.1	33.7	1885
Corn, dry	10.8	10.0	73.4	4.3	1685
Cream	74.0	2.5	4.5	18.5	881
Eggs	73.7	14.8		10.5	695
Figs, dry	18.8	4.3	74.2	0.3	1435
Fish, cod, lean	82.6	15.8		0.4	300
Fish, mackerel, fat	73.4	18.3		7.1	620
Grapes	77.1	1.3	19.2	1.6	435
Ham, smoked	10.3	16.1		38.8	1875
Honey	18.2	0.4	81.2		1475
Jelly	21.0		78.3		1415
Lard				100.0	4080
Meat, beef steak	61.9	18.6		18.5	1090
Milk	87.0	3.3	5.0	4.0	315
Milk, skimmed	90.5	3.4	5.1	0.3	165
Oats (oatmeal)	11.0	11.8	69.2	5.0	1670
Olive Oil				100.0	4080
Onions	87.6	1.6	9.9	0.3	220
Oysters	86.9	6.2	3.7	1.2	230
Peanuts	9.2	25.8	24.4	38.6	2485
Peanut oil				100.0	4080
Pork chops	52.0	16.9		30.1	1535
Potatoes	78.3	2.2	18.4	0.1	375
Raisins	14.6	2.6	76.1	3.3	1560
Rice	12.0	8.0	77.0	2.0	1620
Strawberries	90.4	1.0	7.4	0.6	175
Sugar			100.0		1810
Walnuts	2.5	16.6	16.1	63.4	3180
Wheat (whole)	10.6	12.2	73.7	1.7	1625

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